Personal and Societal Impact of Low Back Pain

Dutmer, Alisa L; Preuper, Henrica R Schiphorst; Soer, Remko; Brouwer, Sandra; Bültmann, Ute; Dijkstra, Pieter U; Coppes, Maarten H; Stegeman, Patrick; Buskens, Erik; van Asselt, Antoinette D I

Published in:
SPINE

DOI:
10.1097/BRS.0000000000003174

Spine

SPINE Volume 44, Number 24, pp E1443–E1451

EPIDEMIOLOGY

OPEN

Personal and Societal Impact of Low Back Pain

The Groningen Spine Cohort

Alisa L. Dutmer, MSc,[*] Henrica R. Schiphorst Preuper, MD, PhD,[*,†] Remko Soer, PhD,[†,‡] Sandra Brouwer, PhD,[§] Ute Bültmann, PhD,[§] Pieter U. Dijkstra, PhD,[*,¶] Maarten H. Coppes, MD, PhD,[†,‖] Patrick Stegeman, MPA,[†] Erik Buskens, MD, PhD,[**] Antoinette D.I. van Asselt, PhD,[**] André P. Wolff, MD, PhD,[†,††] and Michiel F. Reneman, PhD[*]

Study Design. Cross-sectional study.

Objective. The aim of this study was to study the personal and societal impact of low back pain (LBP) in patients admitted to a multidisciplinary spine center.

Summary of Background Data. The socioeconomic burden of LBP is very high. A minority of patients visit secondary or tertiary care because of severe and long-lasting complaints. This subgroup may account for a major part of disability and costs, yet could potentially gain most from treatment. Currently, little is known about the personal and societal burden in patients with chronic complex LBP visiting secondary/tertiary care.

Methods. Baseline data were acquired through patient-reported questionnaires and health insurance claims. Primary outcomes were LBP impact (Impact Stratification, range 8–50), functioning (Pain Disability Index, PDI; 0–70), quality of life (EuroQol-5D, EQ5D; −0.33 to 1.00), work ability (Work Ability Score, WAS; 0–10), work participation, productivity costs (Productivity Cost Questionnaire), and healthcare costs 1 year before baseline. Healthcare costs were compared with matched primary and secondary care LBP samples. Descriptive and inferential statistics were applied.

Results. In total, 1502 patients (age 46.3 ± 12.8 years, 57% female) were included. Impact Stratification was 35.2 ± 7.5 with severe impact (≥35) for 58% of patients. PDI was 38.2 ± 14.1, EQ5D 0.39 (interquartile range, IQR: 0.17–0.72); WAS 4.0 (IQR: 1.0–6.0) and 17% were permanently work-disabled. Mean total health care costs (€4875, 95% confidence interval [CI]: 4309–5498) were higher compared to the matched primary care sample (n = 4995) (€2365, 95% CI: 2219–2526, $P < 0.001$), and similar to the matched secondary care sample (n = 4993) (€4379, 95% CI: 4180–4590). Productivity loss was estimated at €4315 per patient (95% CI: 3898–4688) during 6 months.

Conclusion. In patients seeking multidisciplinary spine care, the personal and societal impact of LBP is very high. Specifically, quality of life and work ability are poor and health care costs are twice as high compared to patients seeking primary LBP care.

Key words: chronic pain, multidisciplinary care, tertiary care, questionnaire, self-report, functioning, disability, quality of life, work ability, productivity loss, healthcare costs, health economics.

Level of Evidence: 3

Spine 2019;44:E1443–E1451

Low back pain (LBP) is the leading cause of disability in Western countries. Years lived with disability caused by LBP increased with 54% between 1990 and 2015 and continue to increase because of a growing and ageing population.[1] Although most people recover rather quickly from a new episode of LBP, one in five adults develops chronic disabling LBP.[2] As a result, the socioeconomic burden of LBP is very high. In Western countries, the societal costs for back pain are estimated to be 1% to 2% of the gross national product.[3–5] The majority of these costs (80%–90%) is caused by productivity loss and disability.[3,6]

From the [*]University of Groningen, University Medical Center Groningen, Department of Rehabilitation, Groningen, The Netherlands; [†]University of Groningen, University Medical Center Groningen, Groningen Spine Center, Groningen, The Netherlands; [‡]Saxion University of Applied Sciences, Expertise Center of Health and Movement, Enschede, The Netherlands; [§]University of Groningen, University Medical Center Groningen, Department of Health Sciences, Community and Occupational Medicine, Groningen, The Netherlands; [¶]University of Groningen, University Medical Center Groningen, Department of Oral and Maxillofacial Surgery, Groningen, The Netherlands; [‖]University of Groningen, University Medical Center Groningen, Department of Neurosurgery, Groningen, The Netherlands; [**]University of Groningen, University Medical Center Groningen, Department of Epidemiology, Groningen, The Netherlands; and [††]University of Groningen, University Medical Center Groningen, Department of Anaesthesiology, Pain Center, Groningen, The Netherlands.

Acknowledgment date: March 1, 2019. First revision date: May 8, 2019. Acceptance date: June 13, 2019.

The manuscript submitted does not contain information about medical device(s)/drug(s).

No funds were received in support of this work.

Relevant financial activities outside the submitted work: board membership.

Address correspondence and reprint requests to Alisa L. Dutmer, MSc, Center for Rehabilitation, P.O. Box 30002, 9750 RA Haren, The Netherlands; E-mail: a.l.dutmer@umcg.nl

DOI: 10.1097/BRS.0000000000003174

A minority of patients with LBP account for the majority of disability and it may be assumed that they account for the majority of costs as well. Less than 28% of LBP cases fall in severe categories, but are responsible for 77% of all years lived with disabilities.[7] This subgroup of patients with persistent disabling LBP has potentially most to gain from effective treatment. Current guidelines recommend multidisciplinary biopsychosocial treatment programs for patients with LBP who have not responded to first-line treatment.[8–10] However, for both multidisciplinary pain treatment and more invasive approaches, such as spinal surgery, there is only low to moderate level of evidence that intervention treatments are effective in the short and medium term. Furthermore, effect sizes are small to moderate and very little is known about the effectiveness of LBP treatments in the longer term.[11–14]

In 2015, the Groningen Spine Cohort (GSC) was initiated to gain a better understanding of the course and prognosis of pain, disability, quality of life, work participation, and medical consumption, as well as the quality and effectiveness of care in patients with LBP seeking multidisciplinary secondary or tertiary care. Data on short-, medium-, and long-term outcomes of LBP are collected using medical records, health insurance data, and patient self-report. The GSC will serve as basis for multiple future studies.

In this first article, we present an extensive overview of all baseline patient characteristics. We also present healthcare costs and productivity costs to answer the following question: what is the personal and societal impact of LBP in patients presenting in multidisciplinary secondary and tertiary spine care?

MATERIALS AND METHODS

Study Design

The GSC study is a 10-year prospective cohort study of patients with LBP referred to a university-based multidisciplinary secondary (patient referred by general practitioner, GP) and tertiary (patient referred by medical specialist, MS) care spine center, the Groningen Spine Center, in the north of the Netherlands. Inclusion of patients ran from July 2015 to July 2018. Baseline and follow-up data are acquired through digital questionnaires and health insurance claims. Before first consultation, all patients digitally filled out a comprehensive set of baseline questionnaires (±45 min). The present study reports results of the baseline questionnaires and presents an overview of health insurance 1 year before baseline and costs of productivity loss 6 months before baseline. The Medical Ethical Committee of the University Medical Center Groningen, the Netherlands provided a waiver (M15.169472) for this study with respect to medical ethical permission. Handling of the data was done in accordance with the guidelines for Good Research Practice.[15]

Patients and Setting

Patients referred to the Groningen Spine Center, between 18 and 65 years' old, with LBP and/or leg pain were eligible for inclusion. All patients were informed on the purpose of the study and signed an informed consent for the use of their health and insurance data based on anonymity. Patients who did not understand Dutch language or had no Internet access were excluded. All patients received care as usual, and inclusion or exclusion did not change content of the treatment. Treatment could consist of minimal intervention only (reassurance, pain education and information), or could be combined with surgery, multidisciplinary rehabilitation, pain anesthesiology treatment, and/or other if needed (for example referral and treatment by a rheumatologist). Optimal triaging and treatment modalities of patients were discussed in a weekly multispecialist meeting with neurosurgeons, neurologists, rehabilitation physicians, radiologists, orthopedic surgeons, anesthesiologists, and physician assistants.

Measures

Questionnaires

National Institutes of Health Minimal Dataset

The National Institutes of Health (NIH) minimal dataset includes 40 items on patient characteristics, medical history, and self-reported symptoms and functioning.[16] Nine of these items (Numerical Rating Scale, NRS, pain, range: 0–10; four items on pain interference, range: 1–5; and four items on physical function, range: 1–5) were used to create an outcome score, the Impact Stratification. The total score on the Impact Stratification ranges from 8 (least impact) to 50 (most impact) and is classified by the NIH Research Task Force as mild (8–27 points), moderate (28–35 points), or severe impact ($\geq$35 points).[16] The Impact Stratification strongly correlates with measures such as the Roland Morris Disability Questionnaire and the Oswestry Disability Index.[16]

Disability

The Pain Disability Index (PDI) measures self-reported disability for seven categories of daily life activities: family/home responsibilities, recreation, social activity, occupation, sexual behavior, self-care, and life support activity. Each item is constructed on a numeric rating scale with 0 indicating no disability and 10 indicating maximum disability revealing total scores from 0 to 70. The Dutch version of the PDI is responsive and 2-week test–retest reliability is good.[17,18]

Quality of Life

Quality of life was measured with the three-level version of the Euroqol-5D (EQ5D) questionnaire.[19] Five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) are measured on three levels each (no problems, some problems, extreme problems). Using a validated algorithm,[20] the EQ5D scores can be converted into a utility value (ranging from −0.33 to 1). Validity, reliability, and responsiveness of the EuroQol-5D are sufficient.[21,22] In

addition, patient-reported health status is measured on a visual analogue scale (EQ-VAS, range 0–100, worst to best health status).

Work Ability

The Work Ability Score (WAS) measures the self-reported current work ability compared to lifetime best. Scores range from 0 to 10, classified as excellent (10 points), good (8–9 points), moderate (6–7 points), and poor (0–5 points) work ability.[23] The WAS has been demonstrated to be a good quick alternative for the Work Ability Index (WAI) for assessing work ability in occupational and primary health care.[24] Convergent validity between the WAS and WAI is acceptable.[25]

Psychosocial Work Environment

Psychosocial work environment was measured with a customized version of the short Copenhagen Psychosocial Questionnaire (COPSOQ II).[26] Twenty-five items on a five-point Likert scale cover domains such as (mental) work demands, work organization and job contents, interpersonal relationship and leadership, and the work-individual interface. Test–retest reliability is adequate to good for the selected items of the customized version.[27]

Productivity Loss

Health-related productivity losses were measured with the Institute for Medical Technology Assessment Productivity Cost Questionnaire (iPCQ).[28] The iPCQ has a recall period of 4 weeks. Two modules measure productivity losses of paid work because of absenteeism and presenteeism. For the present study, the module on absenteeism was expanded with items specifying whether the absence of work was because of LBP. The items on absenteeism and presenteeism have been validated.[29]

Additional Items

Additionally, at baseline, patients answered medical and job-related questions about previous hospital visits and imaging for their current LBP (hospital, year, specialty, imaging type), LBP red flags (previous history of cancer, unexplained weight loss, pain worse at night, systemically unwell, prolonged use of corticosteroids, morning stiffness >1 hour, recent trauma, predominant leg pain), use of pain medication (paracetamol, nonsteroidal anti-inflammatory drugs, opioids, other), and job characteristics (weekly hours, responsibilities, physical demands, adjustments owing to health concerns, and so on).

Health Insurance Claims

Medical costs were obtained from patients who were insured with one of the main Dutch health insurance companies. We expected about 40% of GSC patients to be insured by this company. The Dutch health insurance system is based on managed competition and Dutch citizens are required to obtain a basic insurance package from a health insurer of their choice.[30] Out-of-pocket medical costs were not collected. Health insurance claims were collected 1 year retrospectively before inclusion. A 14-month delay in retrieving cost data was permitted to ensure that all claims were collected.

Data Analyses

Health Insurance Costs

Both total health insurance costs and LBP-related costs were calculated. LBP-related costs were acquired by taking the sum of all health insurance claims that were likely to be related to LBP, for example, claims for pain medication, physiotherapy, medical specialist consults, back related surgery, or other interventions. Health insurance costs of GSC patients were compared to health insurance costs of patients with LBP who did not seek tertiary LBP care. The health insurance company provided 1-year total health insurance costs for two matched (age/sex) samples of patients seeking primary (n = 4995) or secondary care (n = 4993) for LBP.

Costs of Productivity Loss

For the absenteeism module of the iPCQ, patients reported the number of sick days in the past 4 weeks.[28,31] If a patient was on sick leave since before the 4-week recall period they also filled out the date the sick leave started. The number of sick days in the 4-week recall period were extrapolated to 6 months (26 weeks) before baseline by multiplying it by 6.5. Absenteeism costs were then calculated by multiplying the total number of sick days by mean daily working hours and by costs of production loss per hour (2015; €31.80 for women, €38.10 for men).[31] Absenteeism costs were calculated using the friction cost method (FCM), which assumes that after a period of 85 days another worker has fully replaced the absent patient.[31–33] This implies that patients who are disabled for work do not incur productivity costs anymore, as they have been out of the productive process for >85 days. Costs of productivity loss owing to presenteeism, that is, working while sick, were calculated using the number of affected work hours, an efficiency score (numerical rating scale, 0–10) that patients ascribed to their ability to work during those hours, and by the costs of production loss per hour. The sum of costs owing to absenteeism and presenteeism represents the total costs of productivity loss for paid work. Missing data on weekly work hours (in 14% of employed patients) and weekly work days (in 7% of employed patients) were handled with multiple imputation. Constraints were set on the minimum and maximum number of work hours (between 2 and 40 hours) and work days (between 1 and 5) per week.

Statistical Analyses

Descriptive statistics were applied to present baseline patient characteristics. Continuous data are reported as means and standard deviations or medians and interquartile range (IQR), depending on the distribution of the data. Categorical data are presented as frequencies with percentages. Cost data are presented as means with 95%

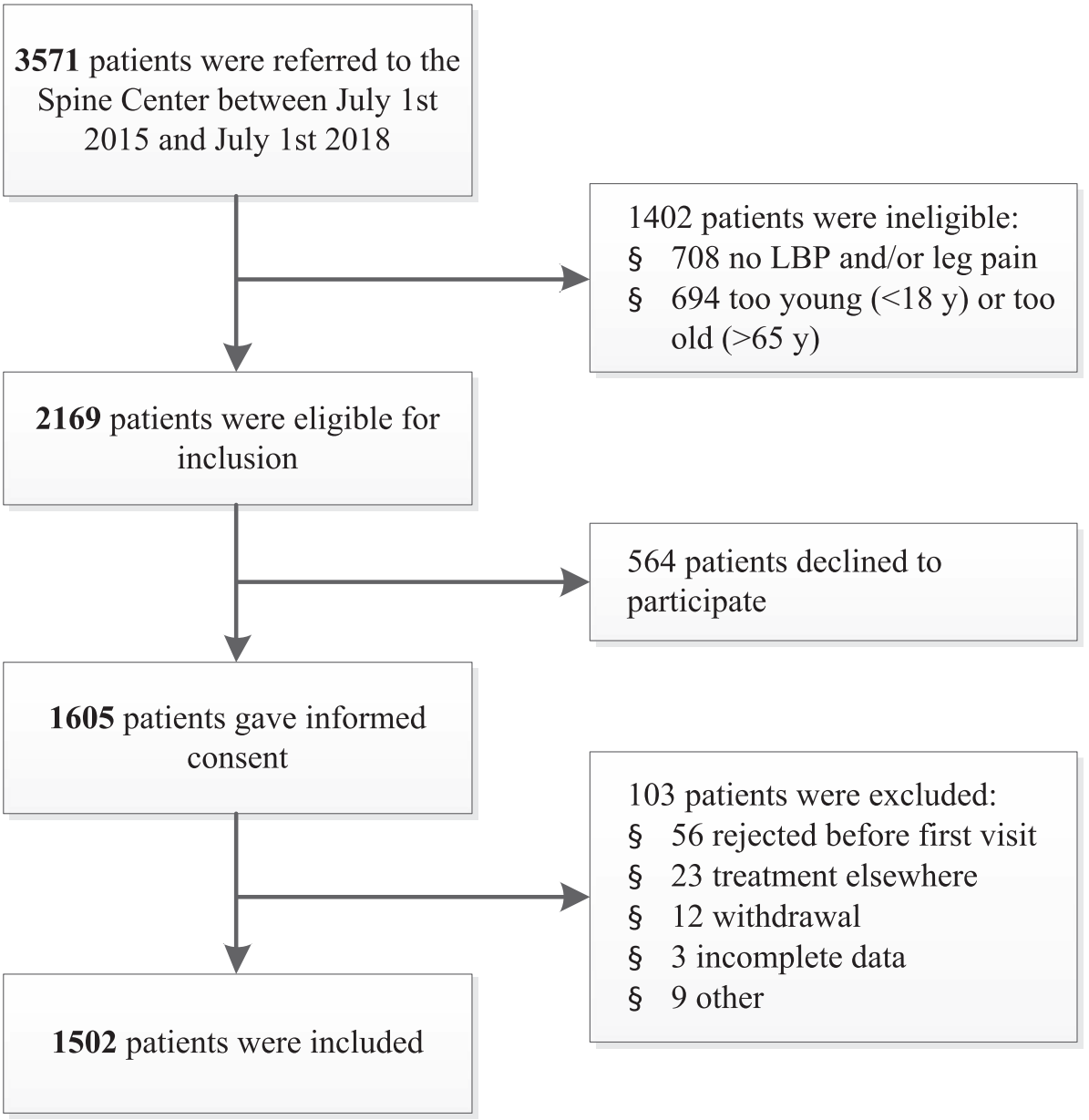

Figure 1. Flow chart of patient inclusion.

bootstrapped confidence intervals. Additionally, results on clinical and work-related primary outcome measures and health insurance data are presented separately for patients who were referred to the Groningen Spine Center by their GP or by an MS. Between-group differences for the two referral subgroups were tested with an independent *t* test, Mann–Whitney *U*, or Pearson χ^2 depending on level of measurement and distribution of data. SPSS software (version 23.0, IBM Corp., Armonk, NY) was used for data analysis. A *P* value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 1502 patients from the Groningen Spine Cohort were included in this study (Figure 1 and Table 1). An extensive overview of patient characteristics and clinical baseline results per item can be found in Appendix 1, http://links.lww.com/BRS/B448. Patients had an average age of 46.3 ± 12.8 years and the majority (57%) were female. Apart from 41 patients, all patients had developed chronic (>3 months) LBP. Exercise therapy was the most common type of treatment used (at any point in time) for LBP (88%), followed by opioids (53%), and LBP operation(s) (26%). The majority of patients (58%) had a score ≥ 35 as measured with the Impact Stratification (severely impacted by the LBP). Quality of life was low with a median EQ5D utility score of 0.39 (IQR: 0.17–0.72) and a health state (EQ-VAS) score of 52.9 ± 19.7 of 100. Patients scored their work ability a 4.0 (IQR: 1.0–6.0) of 10 and 17% of patients were permanently work-disabled (*i.e.*, absenteeism exceeds 2 years). Compared to patients who were referred

TABLE 1. Baseline Characteristics of the Groningen Spine Cohort, a Summary of Clinical and Work-related Outcome Measures

Characteristic	Total (n = 1502)	Referred by GP (n = 853)	Referred by MS (n = 649)
Age, y, mean ± SD	46.3 ± 12.8	45.3 ± 12.9*	47.5 ± 12.7*
Sex, n (%)			
Female	857 (57)	474 (56)	383 (59)
Education level, n (%)			
No education	29 (2)	19 (2)*	10 (2)*
Low	522 (35)	266 (31)*	256 (39)*
Middle	487 (32)	283 (33)*	204 (31)*
High	343 (23)	224 (26)*	119 (18)*
Other	121 (8)	71 (7)*	60 (9)*
Medical history			
Duration LBP, n (%)			
<3 mo	40 (3)	30 (4)	10 (2)
3 mo–1 y	240 (16)	139 (16)	101 (16)
1–5 y	527 (35)	278 (33)	249 (38)
>5 y	695 (46)	406 (48)	289 (45)
Previous medical imaging for current LBP, n (%)	1328 (88)	696 (82)*	632 (96)*
Visited medical specialist for current LBP, n (%)	822 (55)†	398 (47)‡,*	424 (66)§,*
Previous low-back operation(s), n (%)	387 (26)	181 (21)*	206 (32)*
Treatment(s) used for LBP, n (%)			
Opioids	803 (53)	418 (49)*	385 (59)*
Injections	328 (22)	147 (17)*	181 (28)*
Exercise therapy	1316 (88)	785 (89)	558 (86)
Psychological counseling	222 (15)	128 (15)	94 (15)
Pain and functioning			
NRS score back pain (0–10), median (IQR)	7.0 (6.0–8.0)	7.0 (6.0–8.0)	7.0 (6.0–8.0)
PDI total (0–70), mean ± SD	38.2 ± 14.1	37.0 ± 14.1*	39.8 ± 13.8*
NIH minimal dataset Impact Stratification (8–50), mean ± SD	35.2 ± 7.5	34.7 ± 7.5*	36.0 ± 7.3*
Mild (8–27), n (%)	232 (16)	144 (17)*	88 (14)*
Moderate (28–34), n (%)	402 (26)	242 (28)*	160 (25)*
Severe (≥35), n (%)	868 (58)	467 (55)*	401 (62)*
Quality of life			
EQ5D: health state (0–100), mean ± SD	52.9 ± 19.7‖	54.4 ± 19.8¶,*	51.1 ± 19.4#,*
EQ5D: utility value (−0.33 to 1.00), median (IQR)	0.39 (0.17–0.72)	0.57 (0.19–0.73)*	0.30 (0.17–0.69)*
Work			
Work ability (0–10), median (IQR)	4.0 (1.0–6.0)	5.0 (1.0–6.0)*	3.0 (1.0–6.0)*
Work status, n (%)			
Not working	601 (40)	296 (35)*	305 (47)*
Permanent work disability	253 (17)	125 (15)*	128 (20)*
Employed	901 (60)	557 (65)*	344 (53)*
Working	409 (27)	271 (32)*	138 (21)*
Partial sick leave	260 (17)	161 (19)*	99 (15)*
Sick leave	232 (15)	125 (15)*	107 (17)*

EQ5D indicates Euroqol-5D; GP, general practitioner; IQR, interquartile range: quartile 1 to quartile 3; LBP, low back pain; MS, medical specialist; N, number of patients; NIH, National Institutes of Health; NRS, numerical rating scale; PDI, pain disability index; SD, standard deviation.

**P < 0.05.*

†Twenty-three missing.

‡Thirteen missing.

§Ten missing.

‖Eleven missing.

¶Six missing.

#Five missing.

TABLE 2. Health Insurance Costs in Euros 1 Year Before Receiving LBP Care

Sample		*N*	Mean Costs (CI)
Groningen Spine Cohort (secondary/tertiary care)			
All patients	Total	436	4875 (4309–5498)
	LBP-related	435	2175 (1852–2547)
Patients referred by GP	Total	254	3459 (2898–4077)
	LBP-related	253	1569 (1249–1947)
Patients referred by MS	Total	182	6852 (5648–8017)
	LBP-related	182	3018 (2459–3719)
Matched controls			
Primary care	Total	4995	2365 (2219–2526)
Secondary care	Total	4993	4379 (4180–4590)

CI indicates bootstrapped 95% confidence interval for mean: lower bound to upper bound; GP, general practitioner; LBP, low back pain; MS, medical specialist; N, number of patients.

by their GP (57%), patients who were referred by an MS (43%) were older, lower educated, had more often received treatment in the form of surgery, opioids, or injections for LBP, were more disabled, and more severely impacted by their LBP, scored lower on quality of life, and were more often unemployed or on permanent work disability.

Health insurance costs were available for 436 patients (29%) (Table 2). Mean costs for the total GSC sample (€4875; 95% confidence interval [CI]: 4309–5498) were significantly higher than for the matched primary care sample (€2365; 95% CI: 2219–2526; $P < 0.001$) but did not differ significantly from the matched secondary care sample (€4379; CI: 4180–4590; $P = 0.23$). Almost half (€2175; 95% CI: 1852–2547) of the total health insurance costs of GSC patients in the year before visiting the Groningen Spine Center were back pain-related. GSC patients who were referred to the Groningen Spine Center through their GP had significantly lower costs (€3458; 95% CI: 2898–4077) than those who were referred by an MS (€6851; 95% CI: 5648;8017; $P < 0.001$).

A total of 387 of 901 employed patients in the GSC reported sick days in the 6 months before visiting the Groningen Spine Center, which resulted in mean (friction) costs of €1615 (95% CI: 1392–1882) per GSC patient (Table 3). For 85% of patients, LBP was the cause of their sick day(s) (€1380; 95% CI: 1181–1598). A total of 566 patients were affected by reduced productivity while at work, resulting in mean costs of €2700 (95% CI: 2442–2969) per GSC patient. Costs for absenteeism, absenteeism owing to LBP, presenteeism, and total productivity loss were

TABLE 3. Costs Owing to Productivity Loss in Euros 6 Months Before Baseline (Friction Cost Approach)

		N	Mean Costs Per Affected Patient (CI)	Mean Costs Per GSC Patient, n = 1502 (CI)
Groningen Spine Cohort				
All employed patients (n = 901)				
Absenteeism	Total	387*	6546 (5773–7305)	1615 (1392–1882)
	LBP-related	328*	6560 (5814–7269)	1380 (1181–1598)
Presenteeism	Total	566	7165 (6683–7683)	2700 (2442–2969)
Total productivity loss	Total	751*	8773 (8190–9400)	4315 (3898–4688)
Patients referred by GP (n = 557)				
Absenteeism	Total	231*	7540 (6633–8469)	1982 (1655–2328)
	LBP-related	196*	7675 (6641–8823)	1704 (1395–2065)
Presenteeism	Total	357	7130 (6513–7807)	2984 (2650–3312)
Total productivity loss	Total	461*	9300 (8423–10242)	4966 (4435–5585)
Patients referred by MS (n = 344)				
Absenteeism	Total	156*	5074 (4156–6017)	1132 (866–1416)
	LBP-related	132*	4903 (3859–5912)	954 (710–1238)
Presenteeism	Total	209	7225 (6388–8103)	2327 (1968–2726)
Total productivity loss	Total	290*	7936 (6952–8985)	3459 (2908–4059)

CI indicates bootstrapped 95% confidence interval for mean: lower bound to upper bound; GP, general practitioner; LBP, low back pain; MS, medical specialist; N, number of patients.

**Amount of patients who reported sick leave. Some patients still had zero costs as a result of their sick leave when using the friction cost method, which takes into account the replacement of absent workers after 85 days.*

lower for patients referred by an MS than by their GP (presenteeism: $P < 0.05$, absenteeism and total productivity loss: $P < 0.001$).

DISCUSSION

The objective of this study was to assess the personal and societal impact of LBP in patients seeking multidisciplinary secondary and tertiary spine care. We found that patients had an extensive medical history related to their LBP and presented with very low functioning and quality of life. One-third of patients were either on sick leave or were permanently work-disabled. Health insurance costs were twice as high compared to patients seeking primary LBP care and most employed patients reported productivity loss. Patients who were referred to the Groningen Spine Center by an MS were more severely impacted by their LBP than those referred by their GP.

Almost all patients referred to the Groningen Spine Center presented with chronic (>3 months) LBP. A wide variety of interacting biopsychosocial factors have been recognized to contribute to chronic disabling LBP and could have potentially played a role in the recurrence and complexity of LBP in our patient sample.[6] Most notable in our cohort were the presence of leg pain,[34,35] multisite pain,[34,36] catastrophizing,[34] and feelings of depression and/or anxiety[34,36] (Appendix 1, http://links.lww.com/BRS/B448). Still, many factors and underlying mechanisms associated with the transition to persistent disabling LBP are yet unknown.[6]

Two-thirds of patients reported severe pain (NRS pain >7), which aligns with other Dutch LBP and chronic pain samples in primary, secondary, and tertiary care.[37–41] Disability scores, as measured with the PDI, were also similar to those of Dutch chronic pain patients in secondary care.[39,42] Quality of life, however, was very low among GSC patients. The EQ5D utility score for the general Dutch adult population is approximately 0.91.[43] Patients with LBP in primary care scored on average between 0.61 and 0.67.[37,40] Higher scores were also observed in cancer studies, where the median utility score was 0.75.[44] Although other studies have reported on one or few characteristics, this is the first study we know of that reported on multiple characteristics, all showing high personal impact, thus physical, psychological, social, and economic consequences of LBP for the individual patient. In addition, this study adds health insurance and productivity data, demonstrating high societal impact, as well.

Patients' health insurance costs in the year before visiting the Groningen Spine Center were slightly higher compared to patients with LBP seeking secondary care, but twice as high compared to patients seeking primary LBP care. Healthcare consumption for the general Dutch population aged 20 to 65 years is lower at approximately €2100 per year (source: www.vektis.nl/streams/open-data). Almost half of the insurance costs in our sample could be contributed to LBP-related care. Higher LBP-related costs (€4015) were reported in patients with discogenic LBP referred to specialized pain care.[38] However, that study also included direct nonmedical costs such as travel costs. Overall, in the year leading up to seeking multidisciplinary LBP care, GSC patients were likely to have already spent >€2000 on back pain-related care.

The work ability of patients in the GSC was poor (median WAS: 4.0). Seventeen percent of patients were on permanent work disability, whereas on average 6% of the working age population in the Netherlands rely on disability benefits.[45] Return to work is associated with significant improvements in health,[46,47] but unfortunately the probability of returning to work for patients on permanent work disability is low.[48] Work ability was higher, but still poor, for employed patients (median WAS: 5.0) and moderate for employed patients who were working fully (median WAS: 7.0). The average WAS score for nonsicklisted workers from a variety of work fields is 8.0 (SD: 1.1).[49]

Productivity loss costs owing to absenteeism were €1615 per patient during 6 months. The majority (85%) of patients reporting sick leave did so because of back pain. Cost-of-illness studies are notoriously difficult to compare because of little standardization across studies and international variations in health economic guidelines. In the Netherlands, we have endorsed the FCM, which typically produces smaller estimates of productivity losses compared to the human capital method (ranging from twice to 19 times less costs).[50] Using the FCM, a German study on patients with chronic LBP in primary care found significantly lower absenteeism costs of €577 during 6 months.[51] Assuming relatively constant productivity costs in the year before visiting a spine center, a Dutch study on patients in specialized LBP care, using the FCM, reported higher absenteeism costs (€3778) during a period of 12 months.[38]

This study demonstrates that in higher levels of care there is a higher burden of LBP for patients. The impact on quality of life, work ability, and medical consumption is highest for patients seeking tertiary care (referred by MS), followed by secondary (referred by GP), and primary LBP care. Results on societal costs, however, show that patients referred by their GP accrued higher costs than patients referred by an MS, as a result of productivity loss in the 6 months before baseline. This may seem counterintuitive, but can be partly explained by the fact that among the patients referred by their MS, the percentage not working and disabled was higher than in patients referred by the GP. Productivity costs can only be incurred by those currently having a paid job. Furthermore, a higher percentage of employed patients in the MS group compared to the GP group (28% *vs.* 13%) were on sick leave for >267 days (6 months before baseline plus the 85 days friction period), which also lead to zero productivity costs within the applied FCM.

There are some limitations and considerations to this study. First, as the majority of data were collected through patient questionnaires, a potential self-reporting bias could have occurred.[52] Second, the calculated health consumption is an approximation of total medical costs because we did not include direct nonmedical costs or out-of-pocket medical costs. Also, LBP-related health care costs were probably slightly overestimated. All claims with a high probability of

being LBP-related were labeled as such but could still be utilized for different reasons (*e.g.*, pain medication). Nevertheless, a strength of our approach was the use of objective cost data instead of self-report, which excludes recall bias. Productivity loss data could be subjected to recall bias and extrapolating from a 4-week period to 6 months could under- or overestimate productivity loss costs. However, almost all patients reported chronic LBP, so we have reason to believe that productivity loss would not vary greatly during the 6 months before baseline.

CONCLUSION

In patients seeking multidisciplinary secondary and tertiary spine care, the personal and societal impact of LBP is very high. Despite having exhausted a wide variety of health care resources, as demonstrated by an extensive medical history and high health care costs, functioning, quality of life, and work ability are still very poor. Multidisciplinary spine care should target those patients that are most likely to respond to treatment to reduce the personal burden of LBP and to prevent further accumulation of health care costs and productivity loss.

➢ Key Points

- ❑ Patients presenting in multidisciplinary secondary and tertiary spine care were severely impacted by their LBP. Specifically, quality of life and work ability were poor.
- ❑ Health care costs were twice as high compared to patients seeking primary LBP care.
- ❑ Productivity costs were on average €4315 per patient, with 43% of employed patients reporting sick leave in the last 6 months.
- ❑ Patients referred to multidisciplinary spine care by a medical specialist were more severely impacted than those referred by their GP.

Supplemental digital content is available for this article. Direct URL citations appearing in the printed text are provided in the HTML and PDF version of this article on the journal's Web site (www.spinejournal.com).

References

1. GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the global burden of disease study 2015. *Lancet* 2016;388:1545–602.
2. Picavet HS, Schouten JS. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC(3)-study. *Pain* 2003;102:167–78.
3. Lambeek LC, van Tulder MW, Swinkels IC, et al. The trend in total cost of back pain in the Netherlands in the period 2002 to 2007. *Spine (Phila Pa 1976)* 2011;36:1050–8.
4. Hansson EK, Hansson TH. The costs for persons sick-listed more than one month because of low back or neck problems. A two-year prospective study of Swedish patients. *Eur Spine J* 2005;14:337–45.
5. Norlund AI, Waddel G. Cost of back pain in some OECD countries. In: Nachemson AL, Jonsson E, editors. *Neck And back pain: The Scientific Evidence of Causes, Diagnosis Treatment*. Philadelphia (PA): Lippincott Williams, Wilkins; 2000. pp. 421–5.
6. Hartvigsen J, Hancock MJ, Kongsted A, et al. What low back pain is and why we need to pay attention. *Lancet* 2018;391:2356–67.
7. GBD 2013 DALYs and HALE CollaboratorsMurray CJL, Barber RM, Foreman KJ, et al. Global, regional, and national disability-adjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: Quantifying the epidemiological transition. *Lancet* 2015;386:2145–91.
8. Stochkendahl MJ, Kjaer P, Hartvigsen J, et al. National clinical guidelines for non-surgical treatment of patients with recent onset low back pain or lumbar radiculopathy. *Eur Spine J* 2018;27:60–75.
9. Qaseem A, Wilt TJ, McLean RM, et al., Clinical Guidelines Committee of the American College of Physicians. Noninvasive treatments for acute, subacute, and chronic low back pain: a clinical practice guideline from the american college of physicians. *Ann Intern Med* 2017;166:514–30.
10. Low back pain and sciatica in over 16 s: Assessment and management. Available at: https://www.nice.org.uk/guidance/ng59. Updated November 2016. Accessed July 13, 2018.
11. Jacobs W, Van der Gaag NA, Tuschel A, et al. Total disc replacement for chronic back pain in the presence of disc degeneration. *Cochrane Database Syst Rev* 2012;CD008326.
12. Kamper SJ, Apeldoorn AT, Chiarotto A, et al. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain: Cochrane systematic review and meta-analysis. *BMJ* 2015;350:h444.
13. O'Keeffe M, Purtill H, Kennedy N, et al. Comparative effectiveness of conservative interventions for nonspecific chronic spinal pain: physical, behavioral/psychologically informed, or combined? A systematic review and meta-analysis. *J Pain* 2016;17:755–74.
14. Gibson JN, Waddell G. Surgery for degenerative lumbar spondylosis. *Cochrane Database Syst Rev* (4):2005;CD001352.
15. Internationaal richtsnoer voor 'good clinical practice' voor het onderzoek met geneesmiddelen; vertaling naar de nederlandse praktijk. rev version ed. Den Haag: GCP Begeleidingscommissie; 2003.
16. Deyo RA, Dworkin SF, Amtmann D, et al. Report of the NIH task force on research standards for chronic low back pain. *Spine (Phila Pa 1976)* 2014;39:1128–43.
17. Soer R, Reneman MF, Vroomen PC, et al. Responsiveness and minimal clinically important change of the pain disability index in patients with chronic back pain. *Spine (Phila Pa 1976)* 2012;37:711–5.
18. Soer R, Koke AJ, Vroomen PC, et al. Extensive validation of the pain disability index in 3 groups of patients with musculoskeletal pain. *Spine (Phila Pa 1976)* 2013;38:E562–8.
19. EuroQol Group. EuroQol—a new facility for the measurement of health-related quality of life. the EuroQol group. *Health Policy* 1990;16:199–208.
20. Lamers LM, McDonnell J, Stalmeier PF, et al. The Dutch tariff: results and arguments for an effective design for national EQ-5D valuation studies. *Health Econ* 2006;15:1121–32.
21. Brooks R. EuroQol: the current state of play. *Health Policy* 1996;37:53–72.
22. Soer R, Reneman MF, Speijer BL, et al. Clinimetric properties of the EuroQol-5D in patients with chronic low back pain. *Spine J* 2012;12:1035–9.
23. Ilmarinen J, Gould R, Järvikoski A, et al. Diversity of work ability. In: Gould R, Ilmarinen J, Järvisalo J, Koskinen S, editors. *Dimensions of Work Ability: Results of the Health 2000 Survey*. Helsinki: Finnish Institute of Occupational Health; 2008. pp. 13–24.
24. Ahlstrom L, Grimby-Ekman A, Hagberg M, et al. The work ability index and single-item question: Associations with sick leave, symptoms, and health—a prospective study of women on long-term sick leave. *Scand J Work Environ Health* 2010;36:404–12.

25. El Fassi M, Bocquet V, Majery N, et al. Work ability assessment in a worker population: Comparison and determinants of work ability index and work ability score. *BMC Public Health* 2013;13:305.
26. Pejtersen JH, Kristensen TS, Borg V, et al. The second version of the Copenhagen psychosocial questionnaire. *Scand J Public Health* 2010;38 (3 suppl):8–24.
27. Thorsen SV, Bjorner JB. Reliability of the Copenhagen psychosocial questionnaire. *Scand J Public Health* 2010;38 (3 suppl):25–32.
28. Bouwmans C, Krol M, Severens H, et al. The iMTA productivity cost questionnaire: a standardized instrument for measuring and valuing health-related productivity losses. *Value Health* 2015; 18:753–8.
29. Bouwmans C, De Jong K, Timman R, et al. Feasibility, reliability and validity of a questionnaire on healthcare consumption and productivity loss in patients with a psychiatric disorder (TiC-P). *BMC Health Serv Res* 2013;13:; 217-6963-13-217.
30. Schut FT, van de Ven WP. Effects of purchaser competition in the Dutch health system: Is the glass half full or half empty?. *Health Econ Policy Law* 2011;6:109–23.
31. Hakkaart-van Roijen L, Van der Linden N, Bouwmans C, et al. Manual for cost research. methods and standard cost prices for economic evaluations in health care (in Dutch: Kostenhandleiding: Methodologie van kostenonderzoek en referentieprijzen voor economische evaluaties in de gezondheidszorg). 2015.
32. Bouwmans C, Hakkaart-van Roijen L, Koopmanschap M, et al. *Handleiding iMTA productivity cost questionnaire (iPCQ)*. Rotterdam: Erasmus Universiteit; 2013.
33. Koopmanschap MA, Rutten FF, van Ineveld BM, et al. The friction cost method for measuring indirect costs of disease. *J Health Econ* 1995;14:171–89.
34. Hill JC, Dunn KM, Lewis M, et al. A primary care back pain screening tool: Identifying patient subgroups for initial treatment. *Arthritis Rheum* 2008;59:632–41.
35. Traeger AC, Henschke N, Hubscher M, et al. Estimating the risk of chronic pain: development and validation of a prognostic model (PICKUP) for patients with acute low back pain. *PLoS Med* 2016;13:e1002019.
36. Linton SJ, Hallden K. Can we screen for problematic back pain? A screening questionnaire for predicting outcome in acute and subacute back pain. *Clin J Pain* 1998;14:209–15.
37. Hoeijenbos M, Bekkering T, Lamers L, et al. Cost-effectiveness of an active implementation strategy for the Dutch physiotherapy guideline for low back pain. *Health Policy* 2005;75:85–98.
38. Geurts JW, Willems PC, Kallewaard JW, et al. The impact of chronic discogenic low back pain: costs and patients' burden. *Pain Res Manag* 2018;2018:4696180.
39. Koke AJ, Smeets RJ, Schreurs KM, et al. Dutch dataset pain rehabilitation in daily practice: Content, patient characteristics and reference data. *Eur J Pain* 2017;21:434–44.
40. Bekkering GE, van Tulder MW, Hendriks EJ, et al. Implementation of clinical guidelines on physical therapy for patients with low back pain: Randomized trial comparing patient outcomes after a standard and active implementation strategy. *Phys Ther* 2005;85:544–55.
41. Juch JNS, Maas ET, Ostelo RWJG, et al. Effect of radiofrequency denervation on pain intensity among patients with chronic low back pain: the mint randomized clinical trials. *JAMA* 2017; 318:68–81.
42. Karsdorp PA, Vlaeyen JW. Active avoidance but not activity pacing is associated with disability in fibromyalgia. *Pain* 2009;147:29–35.
43. Janssen B, Szende A. Population norms for the EQ-5D. In: Szende A, Janssen B, Cabases J, editors. *Self-reported Population Health: An International Perspective Based on EQ-5D*. Dordrecht; 2014. pp. 19–30.
44. Pickard AS, Wilke CT, Lin HW, et al. Health utilities using the EQ-5D in studies of cancer. *Pharmacoeconomics* 2007;25:365–84.
45. Louwerse I, Huysmans MA, van Rijssen HJ, et al. Characteristics of individuals receiving disability benefits in the Netherlands and predictors of leaving the disability benefit scheme: a retrospective cohort study with five-year follow-up. *BMC Public Health* 2018;18:157.
46. Norstrom F, Virtanen P, Hammarstrom A, et al. How does unemployment affect self-assessed health? A systematic review focusing on subgroup effects. *BMC Public Health* 2014;14:1310.
47. Milner A, LaMontagne AD, Aitken Z, et al. Employment status and mental health among persons with and without a disability: Evidence from an australian cohort study. *J Epidemiol Community Health* 2014;68:1064–71.
48. de Jong PR. Sickness, disability and work: breaking the barriers—a synthesis of findings across OECD countries—OECD. *OECD* 2011;64:115–7.
49. Schouten LS, Bultmann U, Heymans MW, et al. Shortened version of the work ability index to identify workers at risk of long-term sickness absence. *Eur J Public Health* 2016;26:301–5.
50. Pike J, Grosse SD. Friction cost estimates of productivity costs in cost-of-illness studies in comparison with human capital estimates: a review. *Appl Health Econ Health Policy* 2018;16:765–78.
51. Becker A, Held H, Redaelli M, et al. Low back pain in primary care: costs of care and prediction of future health care utilization. *Spine (Phila Pa 1976)* 2010;35:1714–20.
52. Althubaiti A. Information bias in health research: definition, pitfalls, and adjustment methods. *J Multidiscip Healthc* 2016; 9:211–7.